Author's response to reviews

Title: Self-perceived competence correlates poorly with objectively measured competence in Evidence Based Medicine among medical students

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Author's response to reviews: see over
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Professor Ian Wilson,
Associate Editor,
BMC Medical Education.

Dear Prof Wilson,

**MS: 2059356211503123**

**Self-perceived competence correlates poorly with objectively measured competence in Evidence Based Medicine among medical students**

Nai Ming Lai and Cheong Lieng Teng

Thank you for collating the referees’ comments on our draft manuscript, which we received on 1 March 2011. We are pleased to report that we have completed our revisions.

Please find our point-by-point responses to the referees’ actionable comments in the following table, grouped according to the order that the comments appear. We have also highlighted our revisions in the main manuscript using track changes.

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<th>Excerpt of comments</th>
<th>Our response</th>
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<td><strong>Referee 1: Charles Mitchell</strong></td>
<td><strong>Major compulsory revisions</strong></td>
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<td>1. The authors should provide evidence that the material/issues assessed subjectively (confidence) and objectively by the Fresno test (competence) are related. For example, if a RCT of an intervention was a topic were the students asked about their understanding of terms such as absolute risk reduction and number needed to treat and were these measures assessed in the Fresno test?</td>
<td>We have expanded the text under the subheading of “Matching items in the questionnaire and the Fresno test” to demonstrate that the items within the two instruments were related. The following are the added texts: “Within the same domain, there were related items in the two instruments which would enable meaningful correlations. For example, under the domain of “searching for evidence”, question two in the Fresno test required the candidates to list the possible sources for searching clinical evidence, and describe the strengths and limitations of each source listed, and question four required the candidates to describe their search strategy for the clinical scenario in question one. Under the same domain in our questionnaire, items one and two covered the estimated speed and satisfaction of search respectively. Under the domain of “Appraising the evidence”, the items in the Fresno test covered the assessment of knowledge on study...”</td>
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design, internal validity, clinical importance including the derivation and interpretation of EBM expressions such as absolute and relative risk reduction and likelihood ratio. The corresponding items in the questionnaire, on the other hand, covered the understanding of an article on the whole, the self-perceived ability to perform critical appraisal and the understanding of common EBM terms such as those assessed in the Fresno test.”

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<th>Referee 2: Christopher Roberts</th>
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<td>Major compulsory revisions</td>
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2. There was no list of clear crisp research questions. The article hinted the main issue was the correlation between self perceived competence and performance at EBM. However there was also information about questionnaire development and validating of the self perception scale. The results and discussion will more coherently flow from well stated research questions.

As advised by the reviewer, we have added a research question in our introduction. The research question replaces our hypothesis. Below is our revised paragraph:

Introduction, paragraph 4: "In this paper, we report the students' self-perceived competence in EBM as measured by our pilot questionnaire, and the correlation between this and their objectively measured competence in EBM, as represented by the students' performances in the Fresno test. We selected matching items from both tools for correlation, as detailed in our Methods. We set the following research question: Were there significant and important correlations between our medical students' self-perceived competence and their objectively measured competence in the various domains of EBM? We defined significant correlations as the correlations that were statistically significant (as represented in this study by p values of less than 0.05), and important correlations by the correlation coefficients of at least 0.5.”

Regarding the information on the development of our questionnaire, we felt that since we were reporting the findings of a pilot questionnaire, it was appropriate for us to include in our methods some detail on the development and validation of the instrument, even though the validation of the questionnaire was not part of our research question. We included the Cronbach's alpha of our questionnaire in the results to show that our questionnaire had good enough internal consistency to be used as a tool to answer our research question.

3. The Dunning Kruger effect. I believe it is well known that there is no real correlation between competence and performance and those who are.

We are grateful to the reviewer for offering us another perspective on our findings. We have, as suggested, re-worked on introduction and
performance and those who are unskilled tend to over estimate their skills. Accordingly the authors hypothesis might be a little naive. I believe the authors should be upfront about this. Several of the relevant studies on the literature are introduced only in the discussion, they would be better placed in the introduction.

4. Learning outcomes of the EBM Course. These are not stated. The Fresno test focuses very much on epidemiology and biostatistics. If the course focussed only on eg searching, forming questions and appraising, then students will get low Fresno scores.

As suggested by the reviewer, we have expanded the paragraph under the subheading of “EBM training in senior clerkship” to provide greater details on our training program, including the details in journal club sessions and the major learning outcomes. Following is our revised text:

"The students received a structured, clinically-integrated EBM training program within their six-month senior clerkship. This was the final phase of their undergraduate EBM training. This EBM training program, first developed in May 2003, consisted of overview lectures, searching and critical appraisal, and small-group training integrated with bedside clinical sessions and journal club, in which students critically appraised clinical articles and undertook exercises in deriving and interpreting common statistical expressions like relative risk, absolute and relative risk reduction, number needed to treat (NNT) and the likelihood ratio. Throughout the training program, the students were expected to demonstrate an ability in formulating relevant answerable clinical questions, performing searches using appropriate search strategies and identifying the best study type that matches their clinical queries, appraising evidence retrieved from their searches and in the process understanding basic statistical expressions that were commonly reported in the clinical papers, and determining the applicability of the appraised evidence to the local population. Each student was required to develop five EBM reports across different disciplines during their six-month clerkship period using the aforementioned skills. These EBM reports constituted parts of the documents on which the students would be assessed summatively via an oral examination at the end of their medical training. The training program was jointly developed by both authors (NML and CLT). All training sessions including the introductory lectures and small-group sessions were facilitated by the first author (NML), who was then the coordinator of senior clerkship program. The
current study was conducted at the end of the students' EBM training in senior clerkship in July 2006.”

Regarding the reviewer’s comment that the Fresno test focuses mainly on epidemiology and biostatistics, we would like to clarify that the Fresno test covers all the EBM tenets, including asking questions, searching, appraising and applying the evidence (please see Table 1 in our manuscript). Only three questions out of twelve covered the “biostatistical” aspect of EBM, i.e. the derivation and interpretation of basic data. Question 10 covers diagnostic accuracy (deriving sensitivity, specificity, predictive values and likelihood ratio), question 11 covers therapeutic benefits (deriving absolute and relative risk reduction and NNT) and question 12 covers the identification of appropriate 95% confidence intervals given the point estimate.

### Minor essential revisions

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| 5.  | **Table 2 and 3 should be simplified.**  
The authors mainly combine categories for their results |
|   | As advised, we have simplified both tables, by combining the five response ratings into three categories in Table 2, and by omitting the repetitive headings for questions 4 to 16 in Table 3. The revisions were made in the main manuscript using track changes. |
| 6.  | **I didn't really understand the selection of domains in question 4, as it doesn't really illustrate, for example, the students scores across all the domains of the FRESNO test. Similarly with the choice of correlations focussing on searching and appraising evidence** |
|   | We presume that the reviewer means the selection of domains in Table 4. We included only two domains “searching for the evidence” and “appraising the evidence” in Table 4 because out of the four domains in EBM (“Asking questions”, “searching for the evidence”, “appraising the evidence” and “applying the evidence”), correlation was only possible for these two domains, because there was no item in our questionnaire that could fit into the other two domains (“Asking question” and “applying the evidence”) (See table 1). We have amended the results in the paragraph corresponding to the explanation on Table 4 to clarify this further. Our revised text is included as follows: |

Results, paragraph 4:  
“Table 4 shows the students' self-perceived competence, in the form of their sum-ratings in the questionnaire, together with their objectively measured competence, in the form of their sum-scores in the Fresno test under the two domains assessed. Comparisons between the students' self-perceived competence in EBM, as measured by our
questionnaire, and their scores in the Fresno test were only possible in two domains (“searching for the evidence” and “appraising the evidence”) because our questionnaire contained no item in the other two domains (“asking questions” and “applying the evidence”). Comparing the students’ sum-ratings and their sum-scores in percentages, the students in general appeared to rate themselves higher than their actual performance.

We have also amended the title for Table 4 accordingly, as follows:
“Table 4: Sum-ratings (questionnaire) and sum-scores (Fresno test) in the two EBM domains covered in both instruments”

Regarding the reviewers’ other comment on why we chose to report only correlations in specific domains and not correlation between the two instruments as a whole, we believe we have explained this in our Methods (under “Matching items in the questionnaire and the Fresno test”). Both authors felt that since the different domains in EBM assessment tools, like the Fresno test, examine different constructs, an overall correlation would not be meaningful, especially that the Fresno test covers four domains and our questionnaire covers only two.

Discretionary revision

7. The authors could re-consider the low correlation in the context of teaching epi and bio in EBM courses. Perhaps the FRESNO does not have content validity for the level of EBM expected of students in an era of pre-appraised evidence. Teaching in bio and epi is therefore unnecessary or rather a postgraduate skill. Of course the opposite argument will be held by many. What do the authors think?

In our response to the reviewer’s comment no 4, we have detailed the items in the Fresno test to show that it does not focus on epidemiology and biostatistics. We have also elaborated on our EBM training program in response to the same comment to show that the program covered at a basic level, the derivation and interpretation of statistical expressions such as the relative risk, and risk reduction etc. We hope we have shown that there was not such a wide discrepancy between the amount of epidemiology and biostatistics covered in our training program and the amount evaluated in the Fresno test.

We strongly share the notion implied in the reviewer’s comment that the amount of epidemiology and biostatistics, or even critical appraisal skills thought at the undergraduate level need to be critically evaluated, as most of the graduates would become the end-users rather than the producers of clinical evidence. However, we
feel that by expounding on how we feel about the appropriate content of undergraduate EBM training in our discussion, we would run the risk of elaborating beyond what the findings of our small study could directly substantiate. We have therefore only added a short reflective statement at the end of paragraph 3 in our discussion, as follows:

"Our findings collectively also imply a need to critically evaluate our EBM training program to determine the appropriate amount of EBM skills in each domain to be imparted to our students, taking into account of their relevance and retainability, and to highlight to the students the preparatory nature of their undergraduate EBM training and set realistic targets on their expected competence."

We are grateful to the reviewers for their thoughtful comments, which we think have substantially improved our manuscript. We hope our revisions sufficiently address the comments from both referees. We look forward to hearing from you again.

Sincerely,

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Nai Ming Lai
Lead author